

GROWTH AND COLLAPSE OF RHYOLITE DOMES, EAST-CENTRAL MEXICO

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In the Serdan-Oriental Basin in the eastern Trans Mexican Volcanic Belt are found a sequence of monogenetic silicic domes (e.g. Cerro Pinto, Las Derrumbadas, Cerro Pizarro). Their various stages of development offer a unique opportunity to reconstruct events that control the growth and collapse of domes.

All of the above structures have similar chemical compositions ($\text{SiO}_2 > 70\%$, biotite, plagioclase and almandine), and were erupted during the Quaternary in the same geologic and geographic settings. Their morphological differences, therefore, appear to have been controlled by the volume of erupted magma. The smaller edifices, like Cerro Pinto, can be seen as early frozen stages of growth compared to the more mature, complex edifices such as Las Derrumbadas. A synthesis of all our observations allow the recognition of three stages of growth (I, II, III) and two stages of collapse (IV, V).

During Stage I, a small tuff ring forms by phreatomagmatic activity. During Stage II, the tuff ring is enlarged, and a tuff cone consisting of "dry" surge deposits is formed. Stage III is characterized by emplacement of a glassy dome with a pumiceous carapace. Continued extrusion of glassy rhyolite lava leads to slope instability, and first generation debris avalanches occur. These are characterized by hummocky topography, originate from 60-90° sector collapses, consist of chaotic mixtures of older bedrock, surge deposits, and juvenile material (Stage IV). The final stage is characterized by fumarolic activity, and emplacement of small debris avalanches. These are tongue-shaped, monolithologic, and have flat surfaces.

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